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EXPERIMENTS WITH DDT AND OTHER NEW DUSTS FOR CONTROL OF LYGUS spp.
AND THE ALFALFA BEEVIL ON SEED ALFALFA

By F. V. Lieberman and G. A. Hare,
Division of Cereal and Forage Insect Investigations

A preliminary test of DDT, sabadilla, and pyrethrum dusts for control of Lygus spp. on seed alfalfa was made in 1944 on small field plots at Gandy, Millard County, Utah.^{1/} Only DDT showed definite promise of giving satisfactory control of these bugs.

Testing of insecticides was continued in 1945 at Delta and Gandy, Utah, with the emphasis on DDT. Large field plots, averaging 4.8 acres, were used to provide reasonably normal visitation by pollinating bees and to minimize effect of drift of DDT dusts. Each plot was dusted only once, during the prebloom (early bud to late bud) stage. Observations have shown that danger of poisoning pollinating bees is thus avoided, because they do not begin to visit the fields until the flowers open. All dusts were applied with a crop duster mounted on a tractor and operated from its power take-off. The tractor was operated at a speed of 3.75 miles per hour and the duster fan at slightly more than 4000 revolutions per minute. The dusts were discharged several inches above the tops of the alfalfa plants through a boom fitted with 12 V-type nozzles spaced approximately 16 inches apart and connected individually to the fan chamber by flexible tubing. A 15-foot canvas apron was attached to the boom.

Dusting and all subsequent operations in handling, harvesting, and threshing the crop closely approached actual farm practice. Insect counts taken in the plots were based on 100 strokes of a 15-inch insect net. Such counts were taken just before dusting, 3 days after dusting, and thereafter at weekly intervals for 6 weeks. Control estimates are based on the average of those sweepings made in each plot during the 6 weeks following dusting.

^{1/} Lieberman, F. V. Experiments with DDT, sabadilla, and pyrethrum dusts for control of Lygus spp. on seed alfalfa. U. S. Bur. of Ent. and Plant Quar. n-658, 7 pp. [Processed.] 1945.

Results with DDT are shown by the data from second-crop experiments in the delta tract, which are summarized in table 1. The dosages used were 0.6, 1, and 2 pounds of DDT per acre, applied July 13 to 15 as 20 pounds of mixed dust containing 3, 5, and 10 percent of DDT in pyrophyllite.

Table 1.--Effectiveness of DDT in controlling Lygus spp. on second-crop alfalfa grown for seed, delta, utah, July-August 1945.

Treatment (Pounds per acre)	Average	Average	seed yield	increase in seed yield
	<u>Lygus</u> bugs	reduction		
	Number	Percent	Pounds per acre	Pounds
Series I (3 replications)				
DDT 0.6	129	51	207	28
1.0	105	60	237	58
2.0	77	71	314	135
Check	264	--	179	--
Series II (5 replications)				
DDT 2.0	48	80	209	93
Check	235	--	116	--

Control of Lygus was spectacular for 3 to 4 weeks. Thereafter noticeable numbers of nymphs hatching in the plots escaped the effect of the DDT, but the increase in number of bugs on the plants was not enough to warrant a second treatment. Nymphs on second-crop growth were tardy in hatching with respect to crop development, and most plots were dusted before many nymphs had appeared on the plants. More complete control might have been obtained if the dusts could have been applied nearer to large-scale hatching (1 week to 10 days later), but the treatments could not then have been prebloom. Because of the tardy hatching of Lygus nymphs on second growth, all untreated plots bloomed as fully as those dusted. Damage to buds was almost negligible. However, moderate to almost complete stripping of blossoms had occurred in most check plots by August 6, 3 weeks after dusts were applied. The protection afforded by the dusts provided a striking contrast between the treated and untreated areas in the more heavily populated fields at that time.

Populations in the different plots were moderate but varied considerably in size. In the field having the highest population a peak of 1,274 Lygus bugs per 100 net strokes was reached on August 6. Notwithstanding, the 2-pound dosage of DDT gave a reduction of 91 percent,

the best achieved in Delta tract experiments. Lygus control and crop return increased consistently with the dosage of DDT applied. The application of 2 pounds per acre appeared to be fully justified as judged by both control and crop return.

In two experiments performed at Gandy, Utah, the same three dosages of DDT dust were tested on second-crop seed growth. Control of Lygus bugs was considerably better than at Delta, largely because the applications were made just as large-scale hatching of the nymphs began. Unfortunately, yields were spoiled by windstorm and frost. Included in these experiments were two other new dusts, one containing 20 percent of ground sabadilla seed in a 1:3 mixture of hydrated lime and Georgia talc, and the other containing 0.1 percent of pyrethrins and 0.625 percent of piperonyl cyclohexanone in talc. Although the immediate kill of Lygus by both these dusts was excellent, neither had noticeable residual effect and the single applications failed to control the bugs. Nymphs of Lygus quickly became more numerous than they were in these plots before the dusts were applied, and the plots were heavily damaged, one of those treated with the sabadilla dust failing to bloom. The sabadilla dust was applied at the rate of 35 to 40 pounds per acre and the pyrethrum-piperonyl cyclohexanone dust at 25 pounds per acre. Results are summarized in table 2.

Table 2.--Effectiveness of DDT, sabadilla, and pyrethrum-piperonyl cyclohexanone dusts in controlling Lygus spp. on second-crop alfalfa grown for seed, Gandy, Utah, July-September 1945.

Treatment (Pounds per acre)	Experiment 1		Experiment 2		
	Average <u>Lygus</u> population	Reduction	Average <u>Lygus</u> population	Reduction	
	Number	Percent	Number	Percent	
DDT	0.6	25	86	96	73
	1.0	44	75	29	92
	2.0	23	87	5	99
Sabadilla	233	0	427	0	
Pyrethrum-piperonyl cyclohexanone	247	0	--	--	
Check	173	--	352	--	



Experiments at Gandy and Delta indicated that DDT dusts would provide satisfactory control of both Lygus and the alfalfa weevil, (Hypera postica Hbn.) on first-crop seed growth. Five dosages of DDT ranging from 1 to 2.4 pounds of active ingredient per acre gave substantially better control of the alfalfa weevil than is obtained by the use of calcium arsenate at the recommended dosage of 2 pounds per acre. Control of Lygus by the same dosages of DDT dust appeared equally as good as that obtained on second-crop seed growth, but mortality of nymphs inflicted by storms 3 to 6 days after applications of dusts somewhat obscured actual results. There was indication, too, that two prebloom applications on these slower growing and slower maturing fields might be necessary to give best results for control of these two pests together.

In both the Delta and Gandy experiments leafhoppers, aphids, and thrips common to alfalfa fields in Millard County were effectively controlled by the application of 2 pounds of DDT per acre. The results of these experiments indicate that when applied as a dilute dust this is the most satisfactory dosage yet tested against Lygus and other alfalfa seed pests of central Utah, from the point of view of control of insects and increase in yield. This dosage can be satisfactorily applied as a single treatment with a dust containing 10 percent of DDT in pyrophyllite or similar carrier, at the rate of 20 pounds per acre.

In order to avoid the possibility of poisoning bees, DDT should not be applied to the crop after it blooms. Honeybees and wild bees which visit the alfalfa blossoms are essential to the production of seed because of their pollinating activity. The Lygus bug does not usually injure seed alfalfa materially until the plants produce buds. Thereafter buds, flowers, and seed pods are subject to heavy attack. Seed alfalfa should therefore be dusted during the bud stage just as soon as damage to buds is evident. This time usually marks the beginning of volume hatching of Lygus nymphs from eggs laid in the seed growth. If Lygus nymphs are not numerous while the plants are budding, dusting may be delayed until the plants are just beginning to bloom, but no longer.

Until more is known about the quantities of DDT remaining on the plants at harvesttime, and the toxicity of dusted plants to livestock, DDT should not be used on alfalfa crops that are to be pastured or cut for hay, meal, or silage. When used on an alfalfa seed crop, the chaff and straw from threshing should not be fed to livestock, at least not until more information is available on the residues of DDT present in the threshings, and the possible direct or indirect toxic effects of these residues on livestock and man.